A 25: Interaction with Strong or Short Laser Pulses III

Zeit: Donnerstag 10:30–11:15 Raum: VMP 8 R208

A 25.1 Do 10:30 VMP 8 R208

Strong field dynamics of the hydrogen molecular ion under full Coulomb interaction — •Frank Grossmann[1], Alexander Kästner[1], Anatole Kenfack[2], and Jan-Michael Rost[3] — [1]Institut für Theoretische Physik, TU Dresden, 01062 Dresden — [2]Freie Universität Berlin, Institut für Chemie und Biochemie, Takustr. 3, D-14195 Berlin — [3]Max Planck Institute for the Physics of Complex Systems, Nöthnitzer Str. 38 . D-01187 Dresden

In strong field physics the use of the so called soft core potential, which smoothes the Coulomb singularity at the nucleus, is a well accepted approximation. It facilitates the numerical solution of the time-dependent Schroedinger equation considerably. Here, we study the dissociation and ionization of the hydrogen molecular ion under the influence of a strong pulsed laser field and in dependence on the initial vibrational excitation. We compare our calculations using the full Coulomb potential with those of Feuerstein and Thumm using a soft core potential [1]. We conclude that the soft-core calculations severely underestimate the dissociation probability and give reasons for this discrepancy.

[1] B. Feuerstein and U. Thumm, Phys. Rev. A 67, 043405 (2003).

A 25.2 Do 10:45 VMP 8 R208

Non-collinear high harmonic generation — •Andreas Vernaleken, Akira Ozawa, Igor Gotlibovych, Waldemar Schneider, Thomas Udem, and Theodor W. Hänsch — Max-Planck-Insitut für Quantenoptik, Garching

We present the results of our investigation of non-collinear high harmonic generation (NCHHG). In conventional high harmonic generation (HHG), the generated harmonic radiation is emitted collinearly with the fundamental beam. In contrast, when focusing two infrared (IR) beams into a xenon gas jet at a small angle, we observe collimated high harmonic radiation of up to 21st order in a direction which is non-collinear with respect to the driving IR beams.

We have systematically investigated the dependence of NCHHG on experimental parameters such as the delay between the driving pulses for different harmonic orders and will compare our experimental results to a numerical simulation based on a simple model.

The potential application of NCHHG as a combined method for efficient generation and outcoupling of extreme ultraviolet radiation in the next generation of cavity-assisted HHG experiments will be discussed.

A 25.3 Do 11:00 VMP 8 R208

Shaping and application of picosecond-length laser pulses — •Terry Mullins[1], Simone Goetz[1], Magnus Albert[2], Wenzel Salzmann[3], Brett DePaola[4], Roland Wester[5], and Matthias Weidemueller[1] — [1]Universitaet Heidelberg — [2]Aarhus Universitet — [3]Fraunhofer IPM Freiburg — [4]Kansas State University — [5]Universitaet Freiburg

Picosecond-length pulses have a bandwidth which is well suited to study processes taking place over an energy range of a few tens of wavenumbers, while concurrently offering time resolution in the picosecond range. While suitably high-resolution pulse-shapers exist for femtosecond-length pulses [1,2], and are relatively straightforward to build, designing and building a pulse-shaper with suitably high resolution for picosecond pulses is more difficult. The smaller bandwidth means longer path-lengths through the shaper optics are usually required, leading to large devices. We have overcome these problems and developed a compact, suitably high-resolution shaper. One example of a process well-suited to picosecond pulses is the photoassociation of ultracold atoms [3,4], which is most efficient within a few tens of wavenumbers from the dissociation limit, and typically having vibrational dynamics in the tens of picoseconds range. We discuss the application of shaped picosecond pulses to this process.

[1] J. Weiner et al., IEEE J. Quant. Elec. 28, 908 (1992)
[2] F. Verluise et al., J. Opt. Soc. Am. B 17, 138 (2000)
[3] W. Salzmann et al., Phys. Rev. Lett. 100, 233003 (2008)
[4] C. Koch et al., Phys. Rev. A, 70, 013402 (2004)